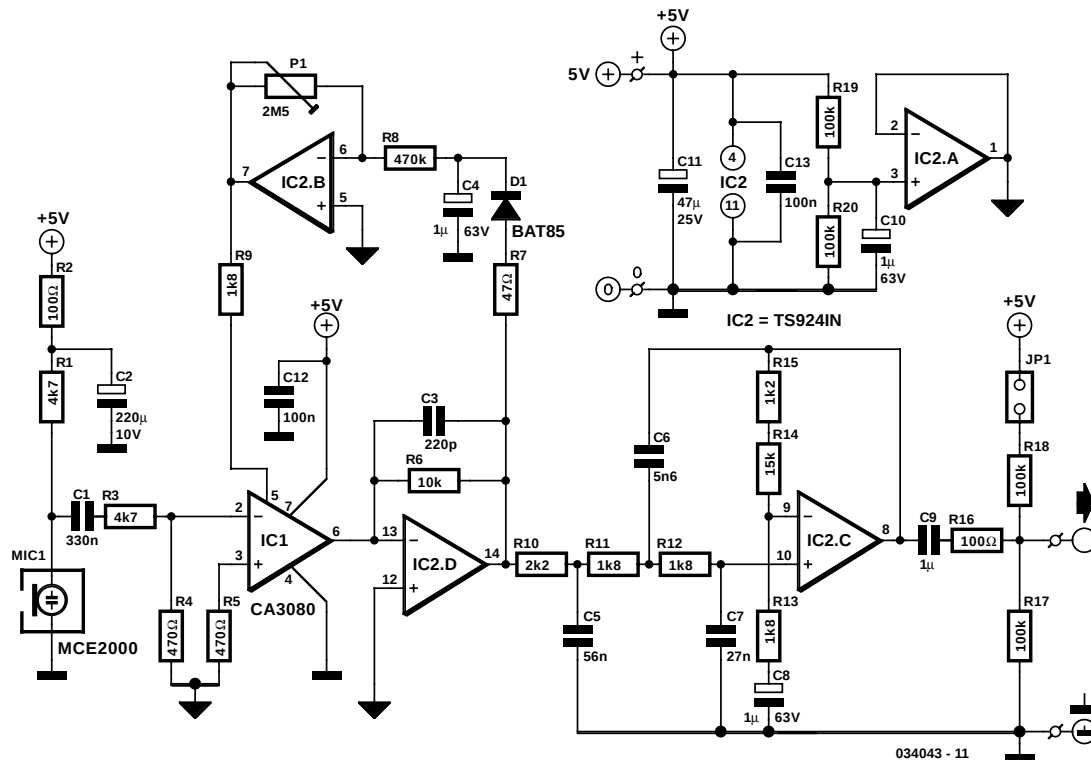


Compressor for Electret Microphone



T. Giesberts

The 'FM Remote Control Receiver' has a connector where an analogue output is made available. To make a simple intercom or P.A. system the associated transmitter needs a microphone pre-amplifier that outputs a signal at the correct level. And that is exactly the function of this circuit. Actually, this design is adapted from a circuit published last year ('AM Modulator for Intercom'). A few things have been changed so that it can work with the 5 V supply from the transmitter module.

The OTA (IC1) used here is the single version (CA3080), which has slightly different characteristics from the dual CA3280. The quad opamp is the same rail-to-rail TS924IN, made by ST. The turnover frequency of the filter (3rd order 1 dB Chebyshev) has been increased slightly to improve the intelligibility of speech and is now about 5.5 kHz. The filter now amplifies the signal by a factor of 10. In practice it is possible that due to various tolerances and the fact that the opamp is not perfect, the filter characteristic shows some deviation from that required. In our prototype it was necessary to change R15 into 2k7 to straighten the response curve.

The DC current variation at the output of the OTA and the resulting offset variation at the output of current/voltage converter IC2d is such that the gain of IC2d has to be substantially smaller than in the 'old' design. Otherwise the output could easily rise to the supply voltage at low signal levels. The value of R6 has therefore been made smaller by a factor of 10.

This has reduced the gain of the circuit by 20 dB, which is compensated for in the filter.

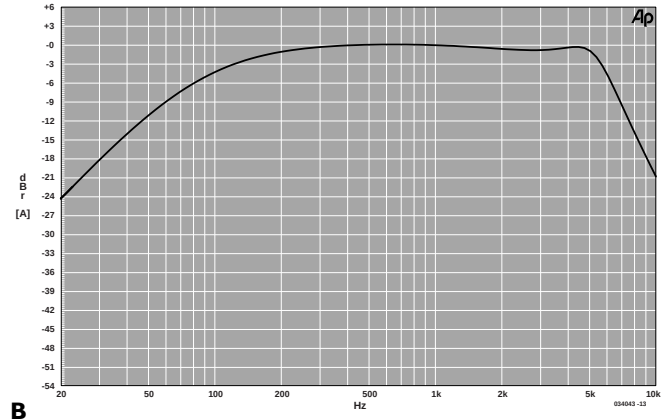
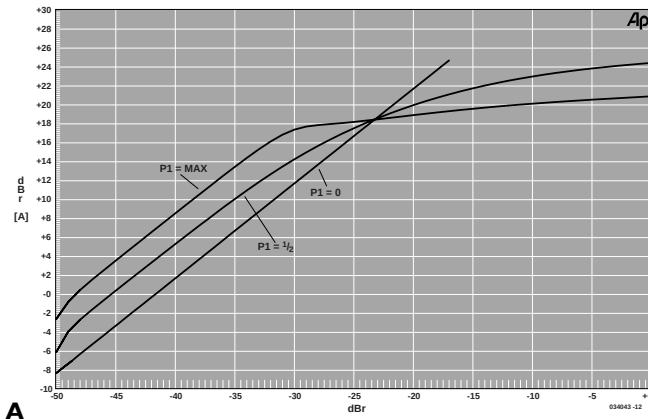
The amplitude of the signal from IC2d is fed back as a control current to the OTA by peak rectifier D1/C3 and inverting amplifier IC2b. R7 limits the loading on IC2d. P1 can be used to adjust the amplifier between a fixed gain and maximum compression.

Figure A shows clearly what effect the circuit has. 0 dB corresponds to 100 mV. The maximum gain, with P1 set to maximum compression, is about 48 dB (250 Ω) for small signals. The minimum gain is about 20 dB (10 Ω). The OTA is then slightly overdriven and the distortion becomes several percent! With a fixed gain selected (P1 shorted) the gain is about 42 dB (125 ×).

The middle curve was measured with P1 in its central position. The curve drawn for a fixed gain (the straight line) doesn't finish at the edge of the graph because the end of the line corresponds to the maximum possible output level, which is 25 dB (≈ 1.76 V or $5 / 2\sqrt{2}$).

Figure B shows the frequency response. The low turnover frequency is mainly determined by C8 (and to a lesser extent by C1) and is about 120 Hz.

The current consumption is about 7 mA. When the circuit is battery powered we recommend the use of three AA cells, because the circuit still works perfectly at 4.5 V. If you want to use a higher supply voltage (maximum 12 V for the de TS924IN and 30 V for the CA3080, but you should also think of the volt-



age across the electret microphone!) you have to keep in mind that the maximum current through R9 (which is I_{ABC}) is only 2 mA. When we consider a maximum chosen current of 1 mA and the maximum output voltage of IC2b (half the supply voltage, which is 2.5 V), then the value of R9 should be $(2.5 - 0.7) \text{ V} / 1 \text{ mA} = 1.8 \text{ k}\Omega$. The value of 0.7 V corresponds to the potential between pin 5 and earth.

For a larger safety margin R9 is calculated with the full supply voltage and a current of 2 mA: $(5 - 0.7) \text{ V} / 2 \text{ mA} = 2\text{k}2$ (rounded upwards). Of course the regulation will then be different (a little less gain).

This circuit and the transmitter module can therefore be fed from the same 5 V supply. Because the transmitter requires a DC offset at its input, a resistor is connected to +5 V via a jumper, which biases the output to half the supply voltage. With the jumper open R17 functions as a load resistor when the output is not connected, because C9 still has to charge up even without a load.

If you're designing a PCB for this compressor then it makes sense to include the transmitter module as well. The current consumption then increases by about 10 mA.